

GET SQUARED! USE A TRENCH MAP

Welcome to Trench Map “*Boot Camp*”. I am taking you back to the basics and then we will go on from there.

Trench Map Letters and Numbers

In the beginning of the transformation of the trench maps from the French (1:80,000) or Belgian (1:40,000) to the British system, each 1:40,000 scale maps was created using 24 squares each 1,000 yards by 1,000 yards (A-X). That gave the total area of any square as 1,000,000 square yards. Each of those squares was divided into 36 sub-squares (1-36) and then each sub-square was divided into 4 sectors (a, b, c, d). The reference for this is the work of Dr. Peter Chasseaud as detailed on the IWM Trench Map DVD “*Understanding a Trench Map*”:

“The British 1:40,000 sheet, covered by this squaring system, was subdivided into twenty-four 6,000-yard squares (or 6,000-yard x 5,000-yard rectangles in the case of the top and bottom rows) each designated by a capital letter (A–X); each of these squares was subdivided into thirty or thirty-six 1,000-yard squares, each designated by a number (1–36); these 1,000-yard squares were further subdivided into four 500-yard subsquares, designated a, b, c and d.”

The main map example thus shows the 24 squares from A to X, which for this demonstration I have broken down into three colour codes. The reason for the different colours will become apparent as this example continues.

A	B	C	D	E	F
G	H	I	J	K	L
M	N	O	P	Q	R
S	T	U	V	W	X

You will note from the Chasseaud statement that it says it is a mixture of 24 squares and rectangles (A-X) but it does not say some squares and two different sizes of

rectangles, but that is exactly what happens when you convert the French (metric = metres) maps into English (imperial = yards) maps. At the beginning, however, they were all squares and they all were subdivided into 36 smaller squares.

1	2	3	4	5	6
7	8	9	10	11	12
13	14	15	16	17	18
19	20	21	22	23	24
25	26	27	28	29	30
31	32	33	34	35	36

To make the Imperial version of the maps conform to the Metric maps, it was necessary to change some of the Big Squares (A-X) into Big Rectangles. This is where the colour coding in the first map comes into play, as here is what happened:

YELLOW	These squares (1,000 yd x 1,000 yd) remained true and each one was divided into 36 sub-squares, each then divided again into quadrants a, b, c, d. Each of the quadrants is 500 yards x 500 yards and they have grid marks 10 x 10 or 50 yards per mark.
GREEN	These rectangles were modified and the one row was no longer used and so it had only 30 sub-squares with quadrants a, b, c, d. They dropped the top row on A-F and the bottom row on S-X. Each quadrant is the same as the yellow squares.
RED	These rectangles contained 6 sub-rectangles on the left (1, 7, 13, 19 25, 31) and six sub-rectangles on the right (6, 12, 18, 24, 30, 36). Each only had 2 quadrants (b, d on the left and a, c on the right).
BLUE	These special corner rectangles had characteristics of both the Green and the Red rectangles. They lost one row (top or bottom) and were missing half their outside column (left or right).

The initial maps that were made were intact and had all the squares, however to date I have not been able to locate one of those maps. If you have one and can provide images, please email me at cefmatrix@gmail.com, for which I will be eternally grateful!

The initial maps were intact and were not missing the top or bottom row or the one-half of each square on the left and right sides. Initially, every square had 4 sub-squares designated a, b, c, and d. It was during the revision process, to make the Imperial maps coincide with the Metric maps that the changes were made.

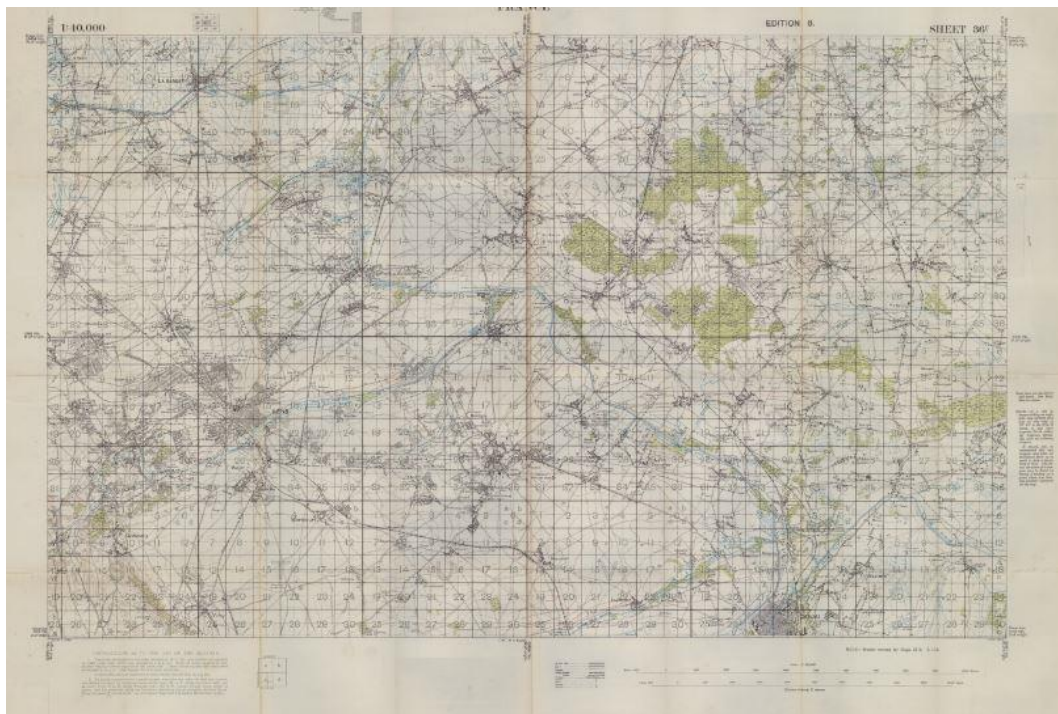
The best way to see where the changes were made is to look at a real trench map. In this case, I have used the [McMaster Map](#) for Lens and Vimy, which in overall appears in four (4) larger sectors of NW, NE, SW and SE:



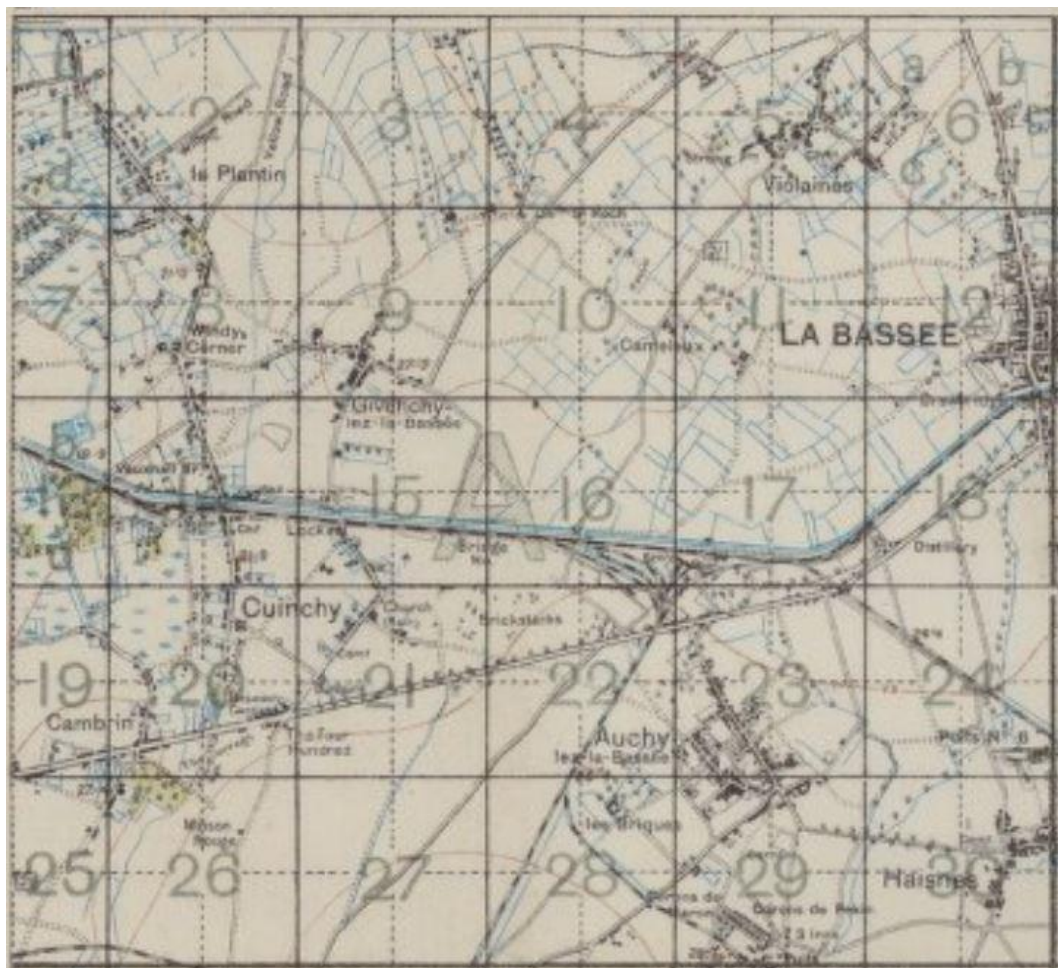
The sub-areas (either squares or rectangles) that are in each of these are:

NW			NE		
A	B	C	D	E	F
G	H	I	J	K	L
SW			SE		
M	N	O	P	Q	R
S	T	U	V	W	X

If you look at the Lens 1:40,000 trench map you will see that square A only shows 30 of the 36 sub-squares, so one might ask where the other six went (31-36 are missing). The same applies to square S at the bottom of the left side. As you look further you will note that all of the top and bottom rows have 30 squares instead of 36. If you look at square H you will see that there are 36 sub-squares. Also if you look down the side, you will see that there are only one-half of each square for the left side (1, 7, 13, 19, 25 and 31) and the same for the right side (6, 12, 18, 24, 30, 36), but drop the 31 and 36 on the top and bottom rows.



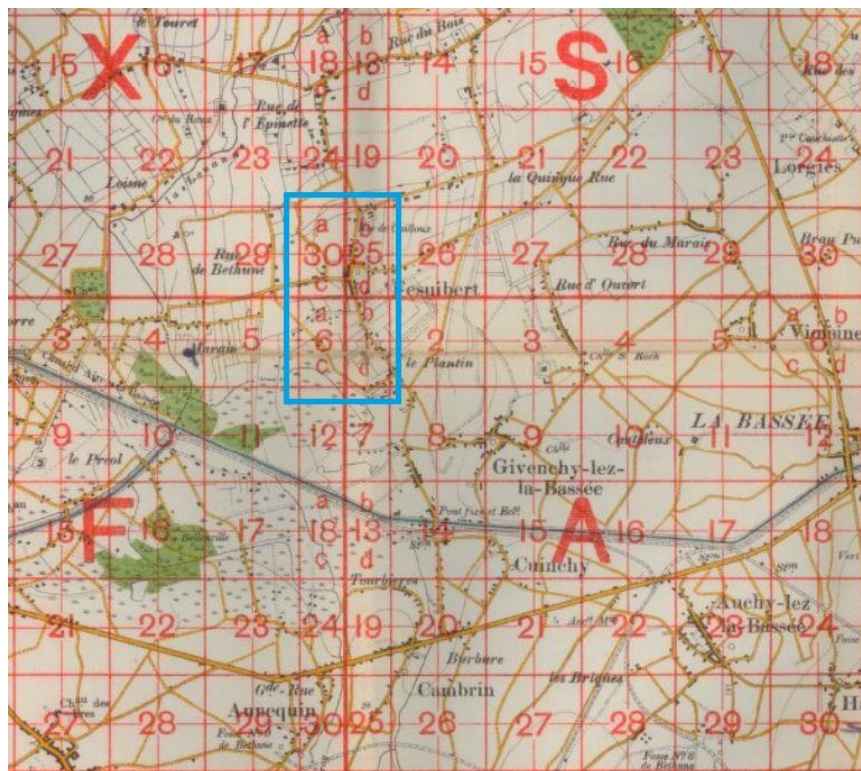
We can show an enlargement of Sector A to show how it as a BLUE SUB-SECTOR has only 5 rows instead of 6 and does not show the left side of the outer quadrants:



Some references report simply that the squares A-X are 6,000 x 6,000 yards (6,000 yards square). Others clarify that there is an exception in that the top and bottom rows are 6,000 x 5,000 yards. As I have shown here, you need to go one step further to clarify that the "special" squares A, S, F and X are only 5,500 yards x 5,000 yards and the "special" squares G, M, L, R are 5,500 yards x 6,000 yards. That means the internal squares *with no outer boundary* are 36,000,000 square yards (H, I, J, K, N, O, P, Q); those with *only a north or south boundary* are 30,000,000 square yards (B, C, D, E T, U, V, W), the four middle sides with *only an east or west boundary* are 33,000,000 square yards (G, M, L, R) and the four corner squares with *multiple boundaries* are 27,500,000 square yards (A, F, S, X).

The McMaster Trench Maps database has a few examples of where they have combined maps, one of which is [Bethune \[Battle of Neuve Chapelle\]](#). Here the map contains parts of four (4) maps, including 36a SE, 36 SW, 36b NE, and 36a NW. I have marked the overlap area with the blue box, which shows you have:

X 30 a	S 25 b
X 30 c	S 25 d
F 6 a	A 1 b
F 6c	A 1 d



In hindsight, I believe it would have been better when they removed the top row of the map that they followed the same procedure they did with the bottom row so that the sub-squares were numbered 7 to 36 instead of 1 to 30. That would have demonstrated that it was the top row that was overlapped with the map above, the same as what is depicted on the bottom where 31 to 36 is missing and is on the map below to match what is shown as Map 51b Squares A1 to A6.

I would agree with those that say that the maps that were routinely used during the war only show half the sub-squares on the left (b, d) and right (a, c) sides of the map but I do not agree that they never existed. They are still there today in the original maps but they are not shown in the maps that were used during the war. The same applies to the top and bottom of the maps, where the rows overlap. If you were to take the full map before it was used to create the "*Revised Squared Map*" in late 1914 then they existed. Dr. Chasseaud refers to this as "*the revised system of squaring*". The original concept remains intact.

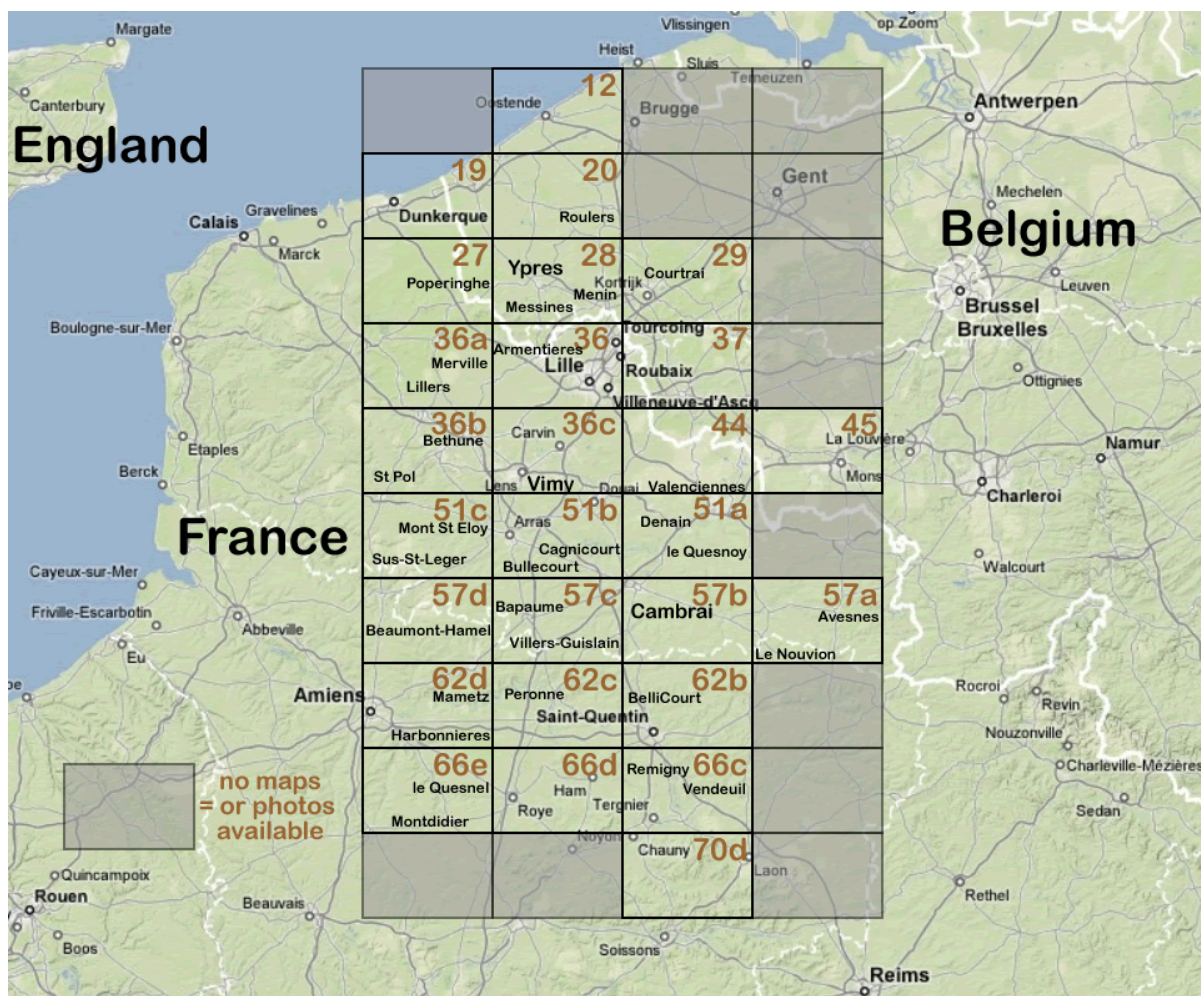
If you refer to the example shown above where the four maps overlap, the original maps *prior to the revised system of squaring* would have been as follows:

X 30 a	X 30 b	+	S 25 a	S 25 b	=	X 30 a	S 25 b
X 30 c	X 30 d		S 25 c	S 25 d		X 30 c	S 25 d
F 6 a	F 6 b		A 1 a	A 1 b		F 6 a	A 1 b
F 6 c	F 6 d		A 1 c	A 1 d		F 6 c	A 1 d

With the *Revised System of Squaring* the right side of the X-F box disappeared, as did the left side of the S-A box.

The Original Maps

Details on the history of the British Trench Maps of the Great War are provided on the web site of the [National Library of Scotland](#). They refer to the original maps as being Belgian 1:40,000 maps in a numbered series from 1 to 72, to which letters were added as the maps were expanded to cover France. This explains why map 36c is the same as map 44a, as the Belgian map 36 was expanded to the west to make 36a, to the southwest to make 36b and directly to the south to make 36c. Likewise Belgian map 44 if expanded to the west would be 44a, which is the same location as 36c. This is clear when you look at the general layout of the maps on the front page of the [McMaster Map Lloyd Reeds Collection](#), as depicted in the image that follows.



The original trench map grid system implemented in 1914 is reported to have been based on the sub-division of each of the 1:40,000 sheets into 5,000 yard squares (5,000 yards x 5,000 yards). My previous colour analysis of the maps provides us with the ability to calculate the coverage of the maps in the original *squaring format* versus the system of *revised squaring*.

YELLOW	6,000 x 6,000 = 36,000,000 square yards (H, I, J, K, N, O, P, Q) 8 yellow = 288 million square yards
GREEN	6,000 x 5000 = 30,000,000 square yards (B, C, D, E T, U, V, W) 8 green = 240 million square yards
RED	5,500 x 6,000 = 33,000,000 square yards (G, M, L, R) 4 red = 132 million square yards
BLUE	5,500 x 5000 = 27,500,000 square yards (A, S, F, X) 4 blue = 110 million square yards
TOTAL	24 Squares = 770 million square yards = 248.58 square miles 22,000 yards high x 35,000 yards wide

(1 square mile = 1,760 yards x 1,760 yards = 3,097,600 square yards = 3.0976 million square yards)

The *original squared* map system consisted of the full complement of 36 squares each 5,000 yards by 5,000 yards for a total of 900 million square yards. That shows that the *revised squaring* maps were approximately 85.6 % of the original maps.

The *revised squaring maps* were not available to the British Expeditionary Force (BEF) at the start of the Great War in August 1914. They instead had to rely on the original Belgian 1:40,000 scale maps or the 1:80,000 scale French maps.

Some indication of the size of the original maps can be gleaned from the larger scale 1:250,000, which I fortunately have in my collection. Each of these maps is marked 1-10 on the vertical border and A-N on the horizontal border. Some of the printed maps are 1-12 on the vertical border; however these do show the overlap onto the next sheet, so we can assume the 1-10 vertical border was standard.



These maps have a scale of 1 centimetre to 2.5 kilometres (1:250,000 scale) or 1 inch to 3.95 miles, so it is apparent these were metric maps. Each horizontal grid A-N (14 blocks) is 5 centimetres (12.5 kilometres) for a total horizontal grid of 175 kilometres. The vertical grid (1-10) is 125 kilometres. Had they used the metric system in the *revised squaring* approach, instead of converting to imperial then all of this would

have been avoided, as the squares would have matched the original Belgian and French maps.

To compare how a *revised squaring* map at a scale of 1:40,000 compared to the 1:250,000 of North West Europe (Sheet 4), I marked out exactly where the limits of France Sheet 51b was on and extract of the 1:250,000 map. The orange square in the extract of the 1:25,000 map is the perimeter of the 1:40,000 51b trench map.

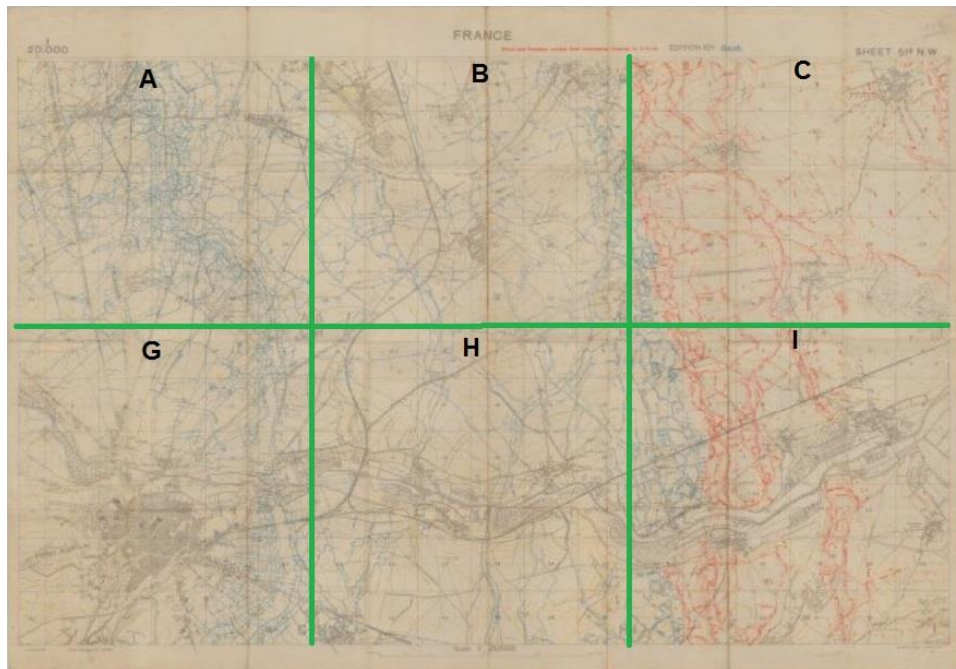


That gave me an inlaid square that was 12.8 cm horizontal (32,000 metres) and 8.05 cm vertical (20,125 metres). From the earlier squares analysis we know that the 51b map is 35,000 yards on the horizontal and 22,000 yards on the vertical. The results are quite comparable:

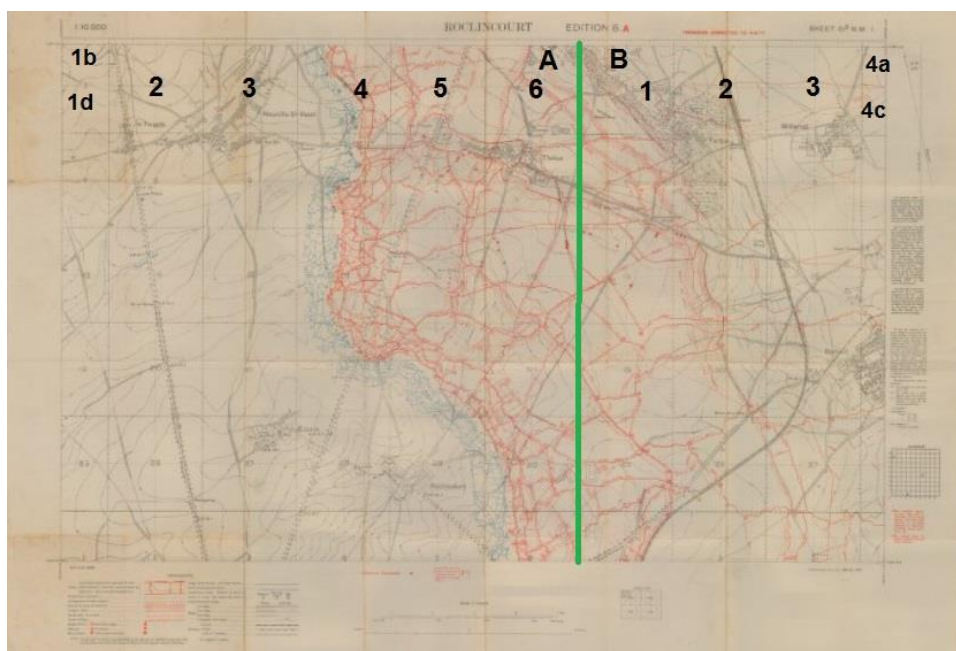
METHOD	VERTICAL	HORIZONTAL
1:40,000 Trench Map	22,000 yards	35,000 yards
	=	=
	20,117 metres	32,004 metres
1:250,000 Area Map	22,009 yards	34,996 yards
	=	=
	20,125 metres	32,000 metres

The Revised Squaring Sub-Maps

Each of the 1:40,000 Trench Maps is divided into four (4) 1:20,000 trench maps, as I showed in an earlier table as NW, NE, SW, and SE. Sticking with the 51b example we can show the 51b NW map that includes all of the sectors A, B, C, G, H and I: *(the green lines and black letters were added for clarity)*



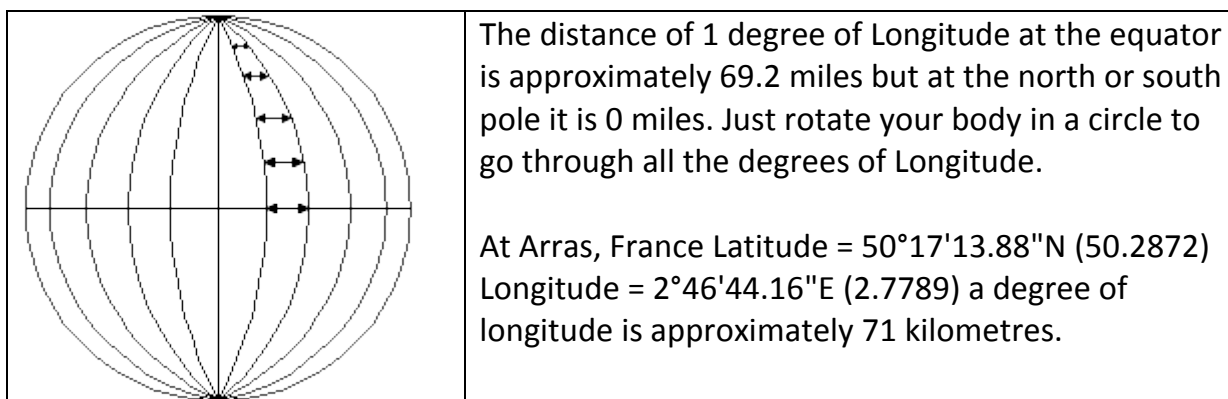
Each of these 1:20,000 sub-maps is then broken down into NW1, NW2, NW3 and NW4 with a 1:10,000 scale. These like the *revised squaring* maps are split in the middle of B4 and H4, as shown here looking at only NW1: *(earlier edition trenches)*



Introducing Latitude and Longitude

It would be remiss not to mention the importance of latitude and longitude as an important component of understanding the trench maps. Not only was this important to those using the maps for large scale offensives in the Great War but now 100 years later for those using GPS and Google Earth to find locations and plot trench overlays. On the small scale the impact is negligible but on the larger scale it is immense. This importance was introduced to the CEFSG Matrix project in 2010 by Member Dave MacLeod who teaches Canadian World Studies at Exeter District High School (my *alma mater*).

Each co-ordinate on a trench map can be linked to longitude and latitude so that it can be used with a modern day GPS unit. Each of these co-ordinates is sub-divided into Degrees, Minutes and Seconds. In a general sense, 1 Minute of Latitude is approximately equal to 1 Nautical Mile (6,076 feet). The longitude issue is trickier to interpret. The simplest way to visualize that is to look at a GLOBE where you can see that the longitudes are 1 nautical mile apart at the equator but they merge as they go to the north and south poles where they are 0 nautical miles apart. For details on this phenomenon, please see the web site of the [RASC Calgary Centre](#), which is partially exhibited here:

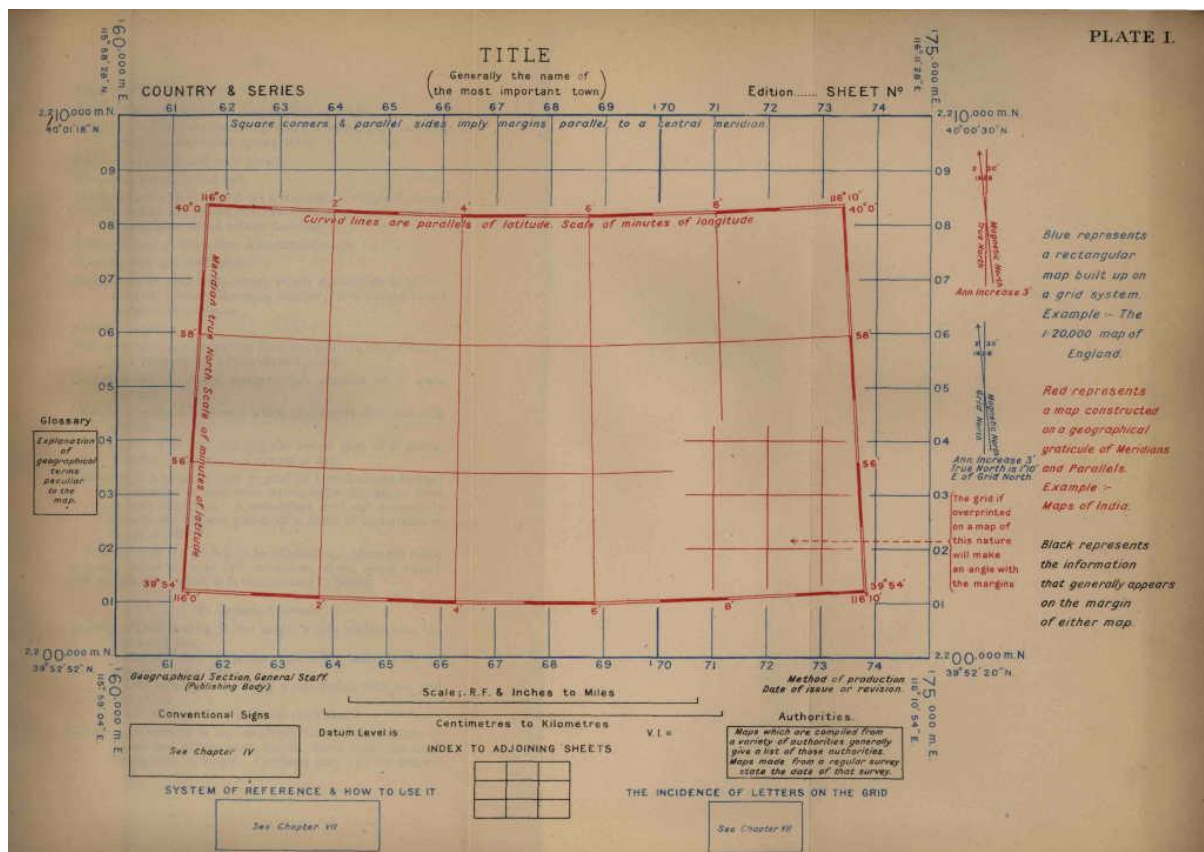


You can find the approximate GPS coordinates for any set of Great War Trench Maps with the on-line [Great War British Trench Map Coordinates Converter](#). If you need to convert GPS readings for Latitude and Longitude you can do this on-line with the [GPS Visualizer Coordinate Calculator](#). To calculate the longitude distance at given latitude you need to know the cosine of the latitude which you can also calculate on-line with [the Cosine Calculator](#).

The puzzle that still remains is what latitude and longitude was used to make the early trench maps and how did they go from the earth as an “oblate spheroid” to a flat plane? To answer that question we must go back to the original maps.

The Origins of the Maps

To demonstrate the difference between the trench maps shown on a flat plane to that of the oblate spheroid, I refer to a classic imaged as provided in "*Manual of Map Reading, Photo Reading and Field Sketching. The War Office. 1929*". The book was written as a training manual for candidates for commission in the British Regular Army. Several inferences in the book date it back to 1917, with the main text printed in 1929. The version I have is #4 and was printed August 31, 1939.

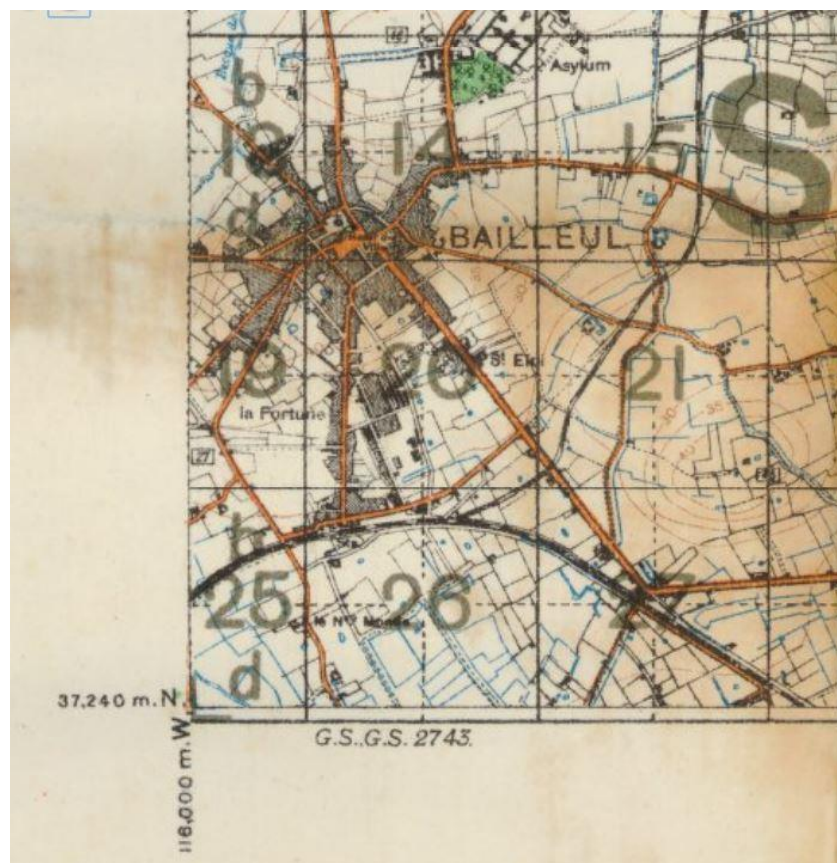


The comparison of the two layouts is perhaps the simplest way to demonstrate the problems of placing locations on a spheroid earth on a flat plane. On the small scale the differences are “*acceptable*” but on the larger scale very critical. You will see quickly, if you look at the map coordinates for the latitude and longitude in the corners that they vary.

One of the first places I erred when I went to look at the circa 1914 Belgian maps was I assumed the Longitude was at the *British Prime Meridian* which runs through Greenwich, England. As it turns out, the Belgian maps are based on the prime

meridian being in the centre of Brussels and thus the corresponding French maps may be based on a prime meridian in Paris. An analysis of the maps reveals the French maps are consistent with the Belgian maps; as the lower left reading in all the maps that are in a straight line with Map 28, such as 51b have the same distance of 116,000 m W and the lower left corner and 84,000 m W in the lower right corner. Map 51b which adjoins 51a has 84,000 m W on the lower left and 52,000 m W on the lower right. That is the 32,000 m distance so these maps really are metric still with imperial measurements for the grid. The imperial squares take up 35,000 yards (32,004 metres) so it appears they decided to just forgo the 2 meter difference on each side of the map.

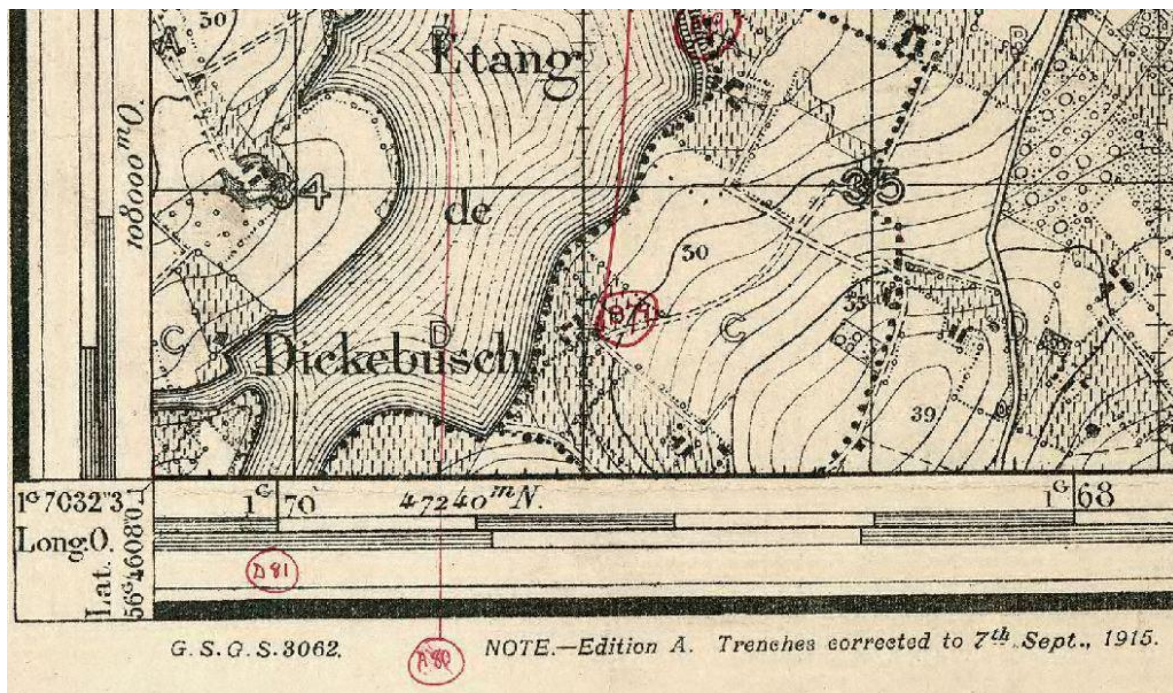
The horizontal grid marks for map 28 are 57,240 m at the top and 37,240 m at the bottom, so the maps are 20,000 m on the vertical. That explains the tiny blank space on the top and bottom margin of each map, as the squares take up a vertical distance of 22,000 yards (20116.8 m) so the blank "lost" space is 58.4 m on the top and bottom of each map.



I was always of the impression that there was 1/2 of each square on the left and right side of each map. If you calculate the difference between the markers on the top or bottom of any map you will find it is 32,000 metres (approximately 34,996 yards).

The map itself is 35,000 yards so that means there are 2 metres unaccounted for on each side of the map. It may be a small amount but that means that in the example in the figure above, the squares S.25.b and S.25.d are encroaching on S.25.a and S.25.c of the original "*Squared Map*". That proves beyond a doubt that part of squares 28.S.25.a and 28.S.25.c are on the Sheet 28 map. Those that claim that the "a" and "c" squares never existed have apparently not gone through the process that details the evolution of the "*Squared Maps*" to the "*Revised Squaring Maps*".

On all the maps, whether in yards or metres, you will see that all four corners are marked with the distances north or south and east or west of some location. It was necessary to find out the reference point of each of these locations. To examine the possible origin of these marks, I used the example of the map that showed the area at the southwest corner of Lake Dickebusch, south of Ypres Belgium. I chose this location as it was one of the oldest trench maps that were available on the Imperial War Museum DVD collection.

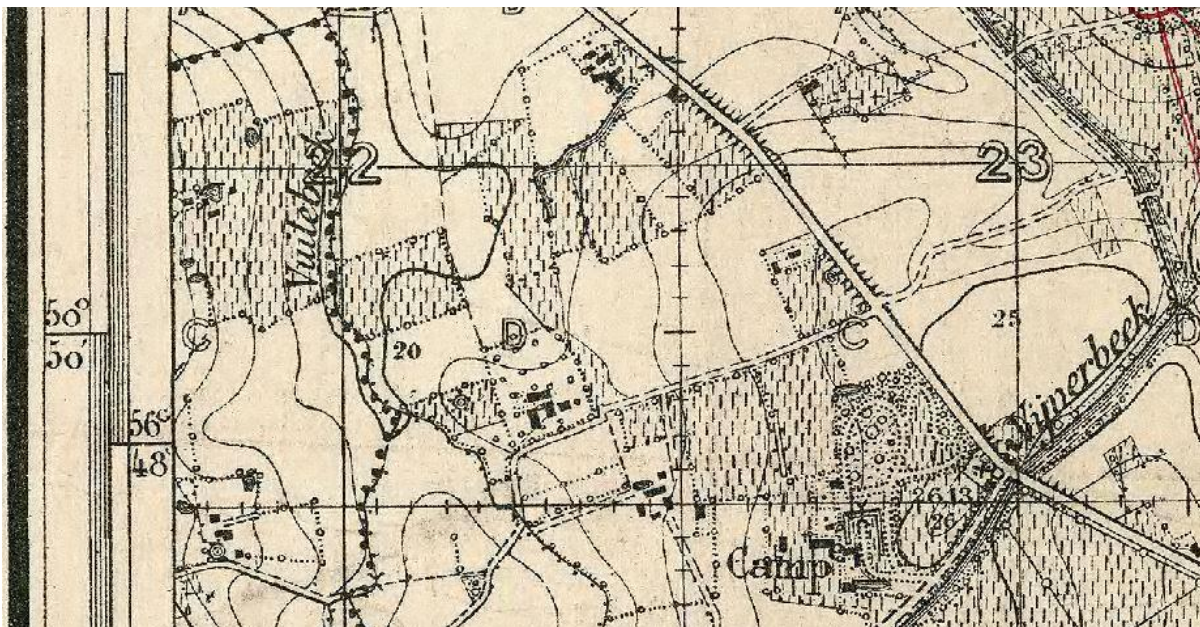


It is important to note that when you are using Google Earth you are relying on the *Prime Meridian* in Greenwich, England. The marks on the trench maps that indicate that they are "x" east or west of a fixed origin, are not based on the British prime meridian, rather a position on continental Europe.

Using Google Earth we made the approximation that this area, at the lower left corner of the map would be at or near 50.8142N 2.8186E. This was not intended to be exact, rather to have a reference point that we could then use to find the origin.



Not being familiar with the Belgian maps, I thought there may be a clue to this on the left hand border where it has both forms of longitude and latitude codes as 50 deg 50 min and the 56G 48?

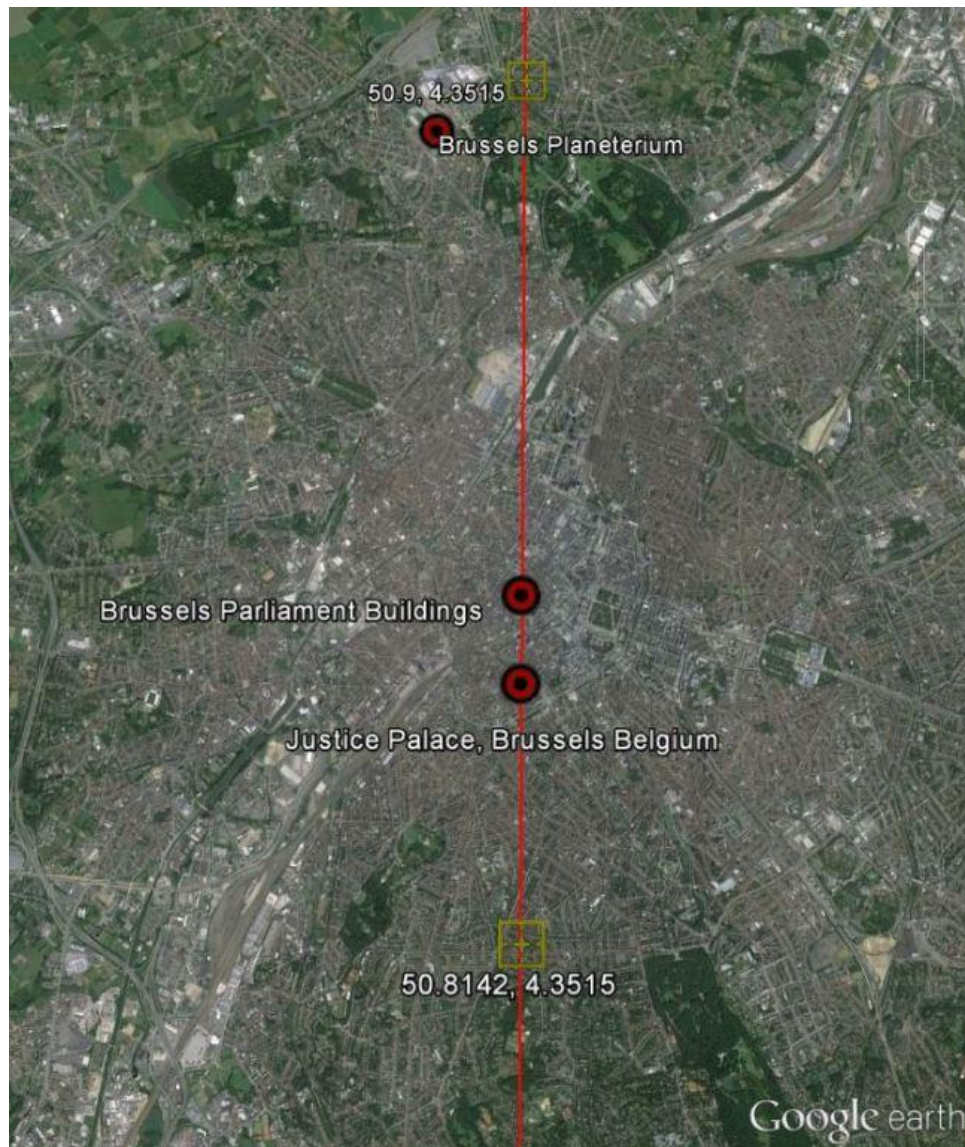


A “call out” to our friends in France and Belgium quickly brought the answer! CEFSG Member Alain Dubois Choulik from Valenciennes, France knew right away they were “Gradients” or “Gons”. That led us quickly to an on-line calculator to convert between *degrees* and *gons*:

- [Kyles Converter: Convert Degrees to Gradians](#)

Using that converter we could then convert the reading $50^{\text{G}}4608$ and arrive at the location on the southwest corner of Lake Dickebush. The point shown as $50^{\text{G}}4608$ is equal to 50.8147 degrees which is a GPS reading of $50^{\circ} 48' 52.92''$ (a little less than the $50^{\circ} 50'$ marked in the map border).

The next question was “*Where exactly is the Prime Meridian for these maps at the Vertical (Longitude) Origin (ZERO)?*” Additional experimentation with Google Earth and we had the line of origin as it passes through both the Brussels Parliament Buildings and the Justice Palace. The Brussel’s Planetarium (*based on the use of the Planetarium at Greenwich*), the first thought, was close but not exact.



Later research into the same question in France would tell us that the *French Prime Meridian* is at the seat of the National Assembly in Paris, France. The Palace Bourbon, is at 126 Rue de l'Université, 75007 Paris, France (48°51'39.37"N 2°19'1.20"E).

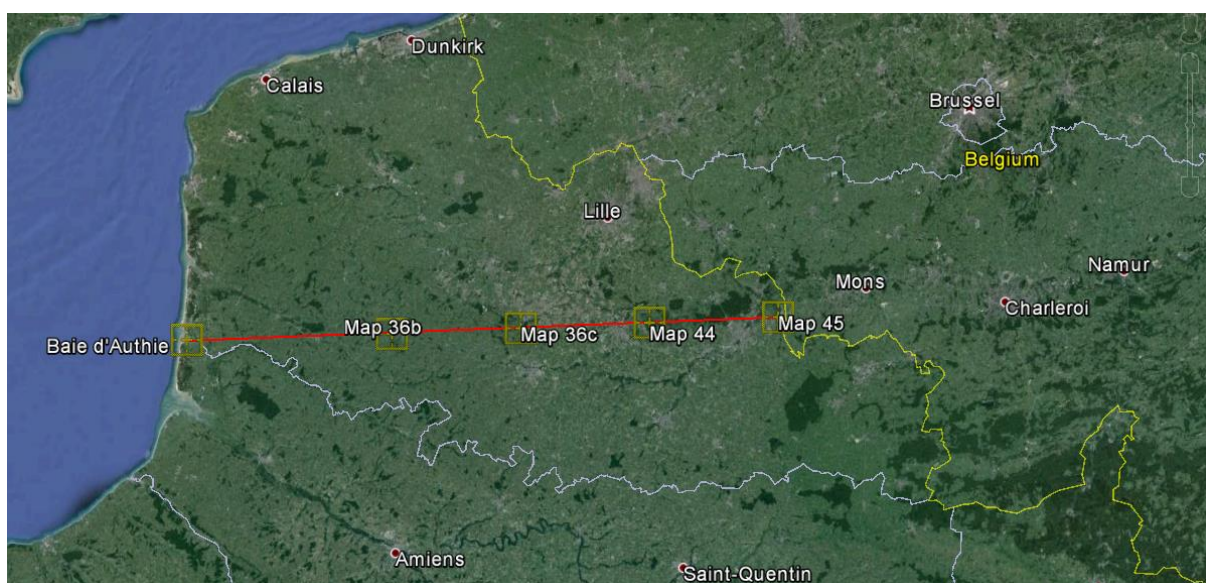
Any references on the maps of Belgium and France appear to be based on “X” metres (or in some cases yards) west of this prime meridian.

The remaining question now was “*Where exactly is the Base Line for these maps at the Horizontal (Latitude) Origin (ZERO)?*” From checking all the maps and when they

split between NORTH and SOUTH it is in the vicinity of top of 36c.S.14 and the bottom of the adjoining square 36.c.S.8 where it becomes 0.00 N=S. Maps 36b and 36c show their lower corner measurements from the origin as 3,019 yards and Maps 44 and 45 switch over to 2,760 metres. If you were not paying attention, who would have noticed they switched for yards to metres between the 30 and 40 series maps? They are apparently the same location as 2,760 metres is 3018.4 metres - so close enough. The same applies on the vertical border between maps 36c and 44 as it switches from the longitude being 91,861 yards to 84,000 metres which are basically equal; It suggests the 40 series maps were made first when they stayed Metric and then when they moved into the 30 series in France they switched to Imperial.

From a review of the maps we can determine that the ZERO ORIGIN of the Latitude is between the 17,240 metres north mark on the upper corners (of any of the maps 36b, 36c, 44 or 45) and the lower corners at 2,760 metres south. The sum of those two numbers is the 20,000 metres that make up each metric map. The total map is 22,000 yards (20,116.8 metres) so we know that the blank space on the top and bottom of each map is 58.4 metres (63.9 yards). The map is divided into 22 squares in any vertical column, so we can calculate that each mark (20 marks per rectangle a-c or b-d) is 45.72 metres. To find the ZERO then we must go up 60.37 marks from the bottom of any map ($2760 \text{ m} / 45.72 = 60.37$). That is close enough to 3 squares up so that a line that runs through any map X.11.c.0.0 on the right or S.8.c.0.0 on the left is the ZERO ORIGIN (i.e. a line from 36b.S.8.c.0.0 to 45.X.11.c.0.0).

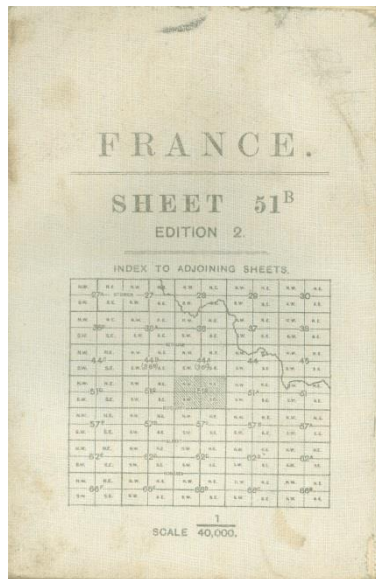
Relying once again on Google Earth we can see where this line is drawn by marking all the ZERO ORIGIN coordinates for maps 36b, 36c, 44 and 45:



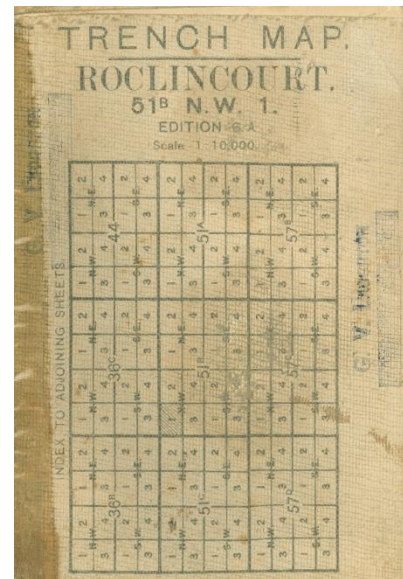
At present, I do not know if we have found the relevance of this line (location) but it appears to be at the "Baie d'Authie" which is in the Somme Region of France.

The Last Step – Using the Trench Map

So as not to presume that everyone has used a trench map to find a location, here is a simple example. In my case, I have my grandfather's original trench maps for the area north of Arras and south of Vimy, known as the Roclincourt sector.

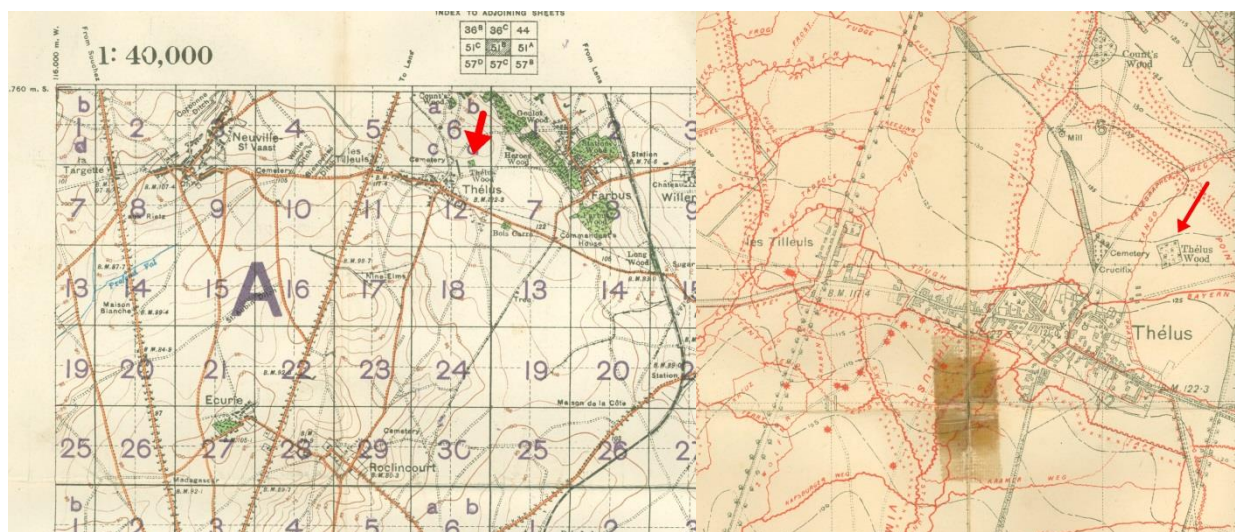


Scale 1:40,000



Scale 1:10,000

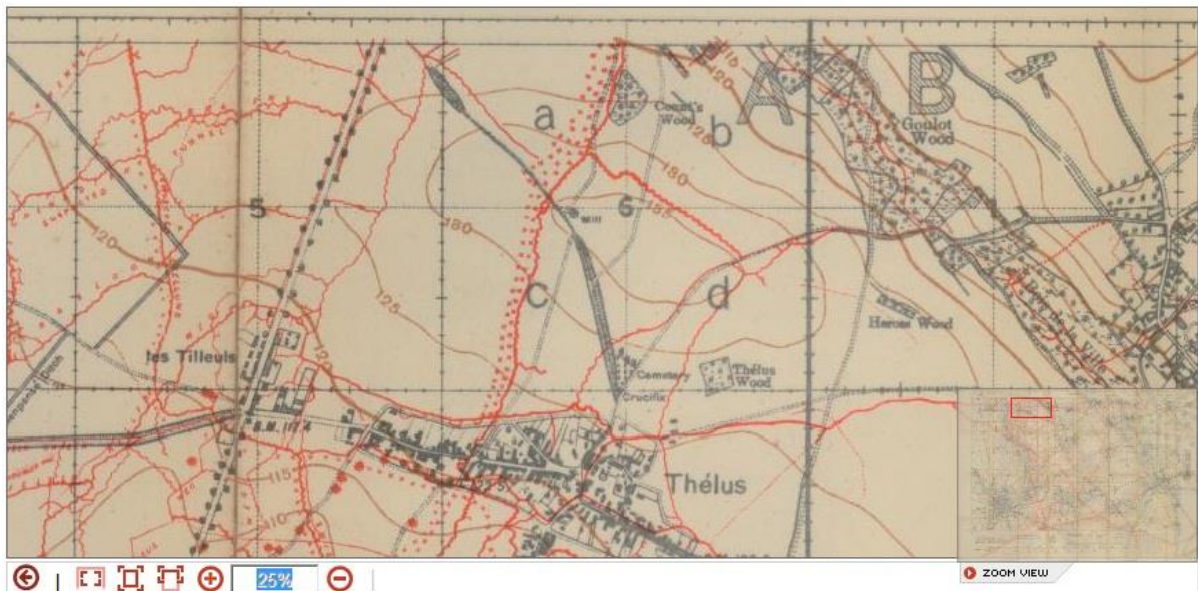
The next step in the process is to look at the details of the map and in the specific areas we are looking at in this example, which has been selected as Thelus Woods in sector A6.



In the early sections of this article we have described how the Main Sectors (Large Alpha Codes) have a variation in the number of squares. In this particular example, we are dealing with Sector "A" so it is missing the top row, which would decrease it from 36 to 30 squares, but it is also missing one-half of all the left squares. The end result is that "A" has 25 squares 1,000 yards by 1,000 yards plus the 5 rectangles on the left that are approximately 500 yards on the horizontal by 1,000 yards on the vertical.

It is important to note that in the case of a composite map you may have two or more maps put together so you must be careful to identify the main map and sector identifiers before looking at the alphanumeric squares. The earlier image of the Bethune Map is a good example.

Once you have moved to SQUARE A you will see the sub-squares (except for the left rectangles) are divided into 4 quadrants, labelled as **a**, **b**, **c**, and **d** starting in the upper left corner. For this example, the 51bNW trench map from the McMaster Collection has been used, as these quadrants are already marked.



If you want to measure the distance between points or time or travel reported in the war diaries, then the following basic information may be of assistance:

- The large squares, such as that identified as **A6** in this example is 1,000 yards by 1,000 yards.
- Each of the large squares has 4 quadrants in a 2 x 2 layout, such as **A6a**, **A6b**, **A6c** and **A6d** each of which therefore measure 500 yards by 500 yards each.
- For precise measurement, particularly to identify enemy emplacements or to set artillery fire, each of the quadrant squares were further sub-divided into 100 smaller squares, thus each was 50 yards by 50 yards. These are not identified on the maps by letters or numbers but rather by the **hash marks** on

the 500 yard squares. For these hash marks you read from the left to the right on the bottom of the square first and then from the bottom of the square upward.

Thelus Woods is located at **51b A6 d.5.1** which says the following:

- on map **51b**
- in the sector **A6**, an area 1,000 yards by 1,000 yards
- in the lower right quadrant **d**, an area 500 yards by 500 yards
- the centre of which is at about **5.1** being 5 marks (250 yards) across and 1 mark (50 yards) up.

If you want to see where this is on Google Earth, use the [Great War British Trench Map Coordinates Converter](#), as previously discussed. As well as providing an image, it gives you the actual GPS coordinates (50.3568, 2.8065) which you can enter in Google Earth.

Great War British Trench Map Coordinates Converter

(Still Experimental - Not working on IE.)

[La Capelle. France.](#) [Vimy Ridge. France.](#) [Passendale. Belgium](#)

Enter the coordinate string using dots to separate the elements (eg: 57c.I.11.d.5.6):

The centroid of grid location 51b.A.6.d.5.1 is at 50.3568, 2.8065.



If you have any questions or comments on this review article, please send them to:

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